

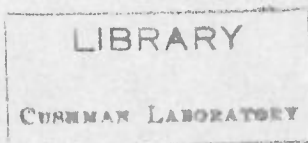
CONTRIBUTIONS
FROM THE
CUSHMAN LABORATORY
FOR
FORAMINIFERAL RESEARCH

VOLUME 23, PART 3
September, 1947

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1947



CUSHMAN LABORATORY FOR FORAMINIFERAL RESEARCH

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These Contributions will be issued quarterly. They will contain short papers with plates, describing new forms and other interesting notes on the general research work on the foraminifera being done on the group by the workers in this laboratory. New literature as it comes to hand will be briefly reviewed.

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CONTRIBUTIONS FROM THE CUSHMAN
LABORATORY FOR FORAMINIFERAL RESEARCH

293. SOME NEW FORAMINIFERA
FROM THE AMERICAN CRETACEOUS*

By JOSEPH A. CUSHMAN and ESTHER R. APPLIN

In recent studies of outcrop and well samples of the lower part of the Upper Cretaceous several species of foraminifera have been found which are undescribed. Although it is always better to have the types from outcrop samples where possible, in a few cases we have found the specimens from well samples much better preserved and have therefore used them as types. The descriptions of the species follow:

AMMOBACULITES ADVENUS Cushman and Applin, n. sp. (Pl. 13, fig. 1)
Ammobaculites stephensoni CUSHMAN and APPLIN (not CUSHMAN), Contr. Cushman
Lab. Foram. Res., vol. 22, 1946, p. 72, pl. 13, fig. 1.

Test small, larger portion close coiled, much compressed, often slightly umbilicate, later portion tending to uncoil; chambers more or less indistinct, 7 or 8 in the adult whorl, increasing very gradually in size as added; sutures very indistinct, slightly curved, little if at all depressed; wall rather coarsely arenaceous but variable, surface fairly smooth; aperture in the adult at the outer end of the last-formed chamber. Length 0.40-0.55 mm.; breadth 0.30-0.40 mm.; thickness 0.10-0.12 mm.

Holotype (Cushman Coll. No. 47372) from the Upper Cretaceous, Woodbine sand, 3½ miles SE. of Gordonville, Grayson Co., Texas.

This species differs from *A. stephensoni* Cushman in the much smaller size, more open umbilical area, and coarser wall with much smaller amount of cement.

AMMOBACULITES AGRESTIS Cushman and Applin, n. sp. (Pl. 13, figs. 2, 3)

Test fairly large, strongly compressed, early portion close coiled, last chambers tending to uncoil; chambers rather indistinct, increasing very gradually in size as added, the uncoiled chambers very irregular in size and shape; sutures slightly depressed but mostly indistinct; wall very coarsely arenaceous, composed of large, dark-colored sand grains with a light-colored cement; aperture terminal, irregular. Length 0.85-1.10 mm.; breadth 0.50-0.70 mm.; thickness 0.16-0.20 mm.

Holotype (Cushman Coll. No. 47374) from the Upper Cretaceous,

* Published by permission of the Director, U. S. Geological Survey.

Woodbine sand, from a core at 2947-65 feet in the Humble Oil and Refining Co.'s well, Merchant and Planters Bank No. 1, Franklin Co., Texas. The species is common in the Woodbine in well sections in Texas and has also been found in the lower part of the middle division of the Atkinson formation in wells in northern Florida, southern Georgia, and Alabama. It is also present but rare in samples studied from the Woodbine outcrop in north central Texas.

This species differs from *A. fragmentarius* Cushman in the smoother finished surface and more definite and depressed sutures and chambers.

AMMOBACULITES GRATUS Cushman and Applin, n. sp. (Pl. 13, fig. 4)

Test of medium size, the early portion close coiled, later portion uniserial, nearly circular in end view; chambers of the coiled portion rather indistinct, about 5 in the last-formed coil, increasing very gradually in size as added, uniserial chambers 2 or 3 in number, distinctly inflated; sutures fairly distinct in the coiled portion, strongly depressed in the uniserial portion; wall distinctly arenaceous but with a considerable amount of cement and smoothly finished; aperture circular, terminal, with a slightly raised lip. Length 0.75-0.90 mm.; breadth 0.30-0.35 mm.; diameter of last-formed chamber 0.25-0.27 mm.

Holotype (Cushman Coll. No. 47376) from the Upper Cretaceous, Woodbine sand, 2 miles east of Whitesboro, Grayson Co., Texas. The species is fairly common in the upper portion of the Woodbine on the outcrop in the Red River area of Texas and has also been found in the middle division of the Atkinson formation in Georgia, Alabama, and Florida.

This species differs from *A. subcretaceus* Cushman and Alexander in the much less compressed test, the last chamber circular in section, and the apertural end with a definite lip.

TROCHAMMINA PARALLELA Cushman and Applin, n. sp. (Pl. 13, fig. 5)

Test very small, much compressed, ventral side distinctly umbilicate, dorsal side slightly concave, periphery rounded; chambers distinct, 9 or 10 in the last-formed whorl, increasing very slightly in size as added, slightly inflated; sutures very distinct, limbate, often slightly raised and darker than the walls of the chambers, nearly radial; wall arenaceous but with a large amount of cement and smoothly finished; aperture a low opening on the ventral side of the last-formed chamber. Diameter 0.25-0.28 mm.; thickness 0.10 mm.

Holotype (Cushman Coll. No. 47378) from the Upper Cretaceous, Eagle Ford shale, from a core at 2783-2801 feet in the Humble Oil and

Refining Co.'s well, Merchant and Planters Bank No. 1, Franklin Co., Texas. This is a small but common and characteristic Eagle Ford species. It is present at a number of outcrop localities and is found in sections drilled through the Eagle Ford shale in Texas.

The species differs from *T. rainwateri* Cushman and Applin in the larger number of chambers, nearly radiate and limbate sutures, parallel sides and broadly rounded periphery.

VALVULINERIA LOBATA Cushman and Applin, n. sp. (Pl. 13, fig. 6)

Test small, about evenly biconvex, periphery subacute to slightly rounded; chambers distinct, only slightly inflated except the lobar expansion at the inner end of the chamber, 6 or 7 in the last-formed whorl, increasing gradually and rather evenly in size as added, those of the earlier whorl showing slightly on the dorsal side; sutures distinct, slightly depressed, very slightly curved; wall smooth, rather coarsely perforate; aperture a narrow opening below the extended lobe on the ventral side. Length 0.45-0.50 mm.; breadth 0.30-0.35 mm.; thickness 0.12-0.15 mm.

Holotype (Cushman Coll. No. 47380) from a relatively deep water phase of the "marine shale" portion of the Tuscaloosa formation in a core at 8178-88 feet, in Humble Oil and Refining Co.'s well, No. 1 Dantzler, sec. 33, T. 4 S., R. 11 W., Harrison Co., Mississippi. The species is common in this sample.

The species differs from *V. cretacea* (Carsey) in the more prominent lobe on the ventral side, less inflated chambers, and more angled periphery.

ANOMALINA OBESA Cushman and Applin, n. sp. (Pl. 13, fig. 7)

Test nearly bilaterally symmetrical, sides somewhat concave, periphery broadly rounded; chambers distinct, inflated, 7 or 8 in the last-formed whorl, increasing gradually and somewhat unevenly in size as added; sutures distinct, radial, strongly depressed; wall smooth, finely perforate; aperture a low opening near the periphery on the ventral side. Diameter 0.37-0.45 mm.; thickness 0.20-0.23 mm.

Holotype (Cushman Coll. No. 47382) from a relatively deep water phase of the "marine shale" portion of the Tuscaloosa formation in a core at 8178-88 feet, in Humble Oil and Refining Co.'s well, No. 1 Dantzler, sec. 33, T. 4 S., R. 11 W., Harrison Co., Mississippi. Specimens are common in this sample.

This species differs from *A. nelsoni* W. Berry in the more open umbilical portion, the very strongly inflated chambers, and broadly rounded periphery.

CONTRIBUTIONS FROM THE CUSHMAN LABORATORY
294. TWO NEW SPECIES OF FORAMINIFERA
FROM THE ARKADELPHIA MARL OF ARKANSAS

BY JOSEPH A. CUSHMAN

In the collection of Foraminifera made by Dr. W. H. Deaderick and left by him to the U. S. National Museum are many species from the Upper Cretaceous of Arkansas. In the rich collections from the Arkadelphia marl are many species not hitherto recorded from that formation, and among them the following two new species:

GAUDRYINA DEADERICKI Cushman, n. sp. (Pl. 13, figs. 8-10)

Test rather small, compressed, sides flattened, gradually tapering, the initial end subacute, triserial, later portion gradually increasing in width, the maximum width formed by the last two chambers, periphery serrate; chambers of the earlier triserial portion rather indistinct, later biserial ones distinct and somewhat inflated, increasing rapidly in size as added, peripheral margin often slightly angled; sutures distinct and somewhat depressed except in the early triserial portion; wall very finely arenaceous, rather smoothly finished; aperture elongate, in the apertural face with a slightly raised border. Length 0.65-0.75 mm.; breadth 0.30-0.40 mm.; thickness 0.25 mm.

Holotype (U. S. N. M. No. 104238) from the Upper Cretaceous, Arkadelphia marl, highway No. 4, 5 miles NW. of Hope, 100 yds. E. of airport beacon, Hempstead Co., Arkansas.

This species differs from *Gaudryina rudita* Sandidge in the more flaring form, flattened faces, truncate periphery, serrate margin, and much more rapid expansion of the chambers. It is very common at the type locality.

PLANULARIA DEADERICKI Cushman, n. sp. (Pl. 13, figs. 11-12)

Test very strongly compressed, periphery slightly keeled, dorsal margin strongly curved, in the adult with the ventral margin becoming nearly straight, early portion close coiled, later uncoiling slightly; chambers numerous, the last 3 or 4 uncoiled, rather indistinct due to the surface ornamentation, not inflated, increasing very gradually in size as added; sutures curved, slightly thickened, not depressed; wall ornamented by numerous, curved, longitudinal costae, independent of the chambers, nearly parallel to the dorsal margin; aperture terminal, radiate. Length 0.75-1.25 mm.; breadth 0.37-0.50 mm.; thickness 0.12-0.15 mm.

Holotype (U. S. N. M. No. 104240) from the Upper Cretaceous, Arkadelphia marl, highway No. 4, 5 miles NW. of Hope, 100 yds. E. of airport beacon, Hempstead Co., Arkansas.

This species resembles *Planularia dissona* (Plummer) but differs mainly in the highly ornamented surface. It is very common at the type locality.

295. A NEW SPECIES OF *BULIMINA*
FROM THE EOCENE, CHIRA SHALE, OF PERU

BY JOSEPH A. CUSHMAN and BENTON STONE

Since the publication of our paper on the foraminifera of the Chira shale of Peru a number of specimens of a *Bulimina* have been found which seem to belong to a new species.

BULIMINA (DESINOBULIMINA) DIVERSA Cushman and Stone, n. sp. (Pl. 14, figs. 1-3)
Bulimina cf. *ovata* CUSHMAN and STONE (not d'ORBIGNY), Special Publ. 20, Cushman Lab. Foram. Res., 1947, p. 14, pl. 2, fig. 14.

Test fusiform in front view with the greatest breadth above the middle, initial end rounded, apertural end broadly rounded, circular in transverse section; chambers fairly distinct in the later portion, very slightly inflated, increasing very rapidly in size as added; sutures very slightly depressed in the later portion; wall smooth; aperture terminal with a slightly raised and rounded margin and a projecting tooth-like portion in the aperture. Length up to 1.00 mm.; diameter up to 0.65 mm.

Holotype (Cushman Coll. No. 50000) from the Eocene, Chira shale, Quebrada Siches, near El Alto, 20 miles N. of Talara, Dept. of Piura, NW Peru.

This species differs from typical *B. ovata* d'Orbigny in the rounded base, broadly rounded apertural end, the greatest width toward the apertural end, and the *Desinobulimina* type of aperture.

It is very close to the form figured by Parker and Bermúdez as *Bulimina* cf. *pupoides* d'Orbigny from the Eocene of Cuba (Journ. Pal., vol. 11, 1937, pl. 59, fig. 5).

296. SOME NEW SPECIES OF FORAMINIFERA
FROM THE LOWER PLIOCENE OF THE NETHERLANDS

BY J. A. CUSHMAN and A. TEN DAM

The following species are from a series of boring samples from new borings in the western Netherlands which yielded very rich foraminiferal faunas.

TEXTULARIA DECRESCENS Cushman and ten Dam, n. sp. (Pl. 14, fig. 5)

Test short, nearly as broad as long, broadly rounded in end view, periphery broadly rounded, greatest breadth at about the middle, then tapering rapidly toward either end; chambers few, fairly distinct in the later portion, increasing very rapidly in size as added; sutures fairly distinct in the later portion, only slightly depressed; wall rather coarsely arenaceous but with a large proportion of cement and smoothly finished; aperture a low opening at the inner margin of the last-formed chamber, without a lip. Length 0.85-1.10 mm.; breadth 0.70-0.80 mm.; thickness 0.60-0.70 mm.

Holotype (ten Dam Coll. No. A 130) from the lower Pliocene at a depth of 386-390 meters, in Breukelen boring, near Utrecht, Netherlands. Paratypes: Geol. Stichting, Haarlem, Coll. No. F 1064 and Cushman Coll. No. 48694.

The species is fairly common in the lower Pliocene of the western Netherlands.

It somewhat resembles *T. abbreviata* d'Orbigny from the Miocene of the Vienna Basin, but differs in the more convex test, the strongly rounded periphery, and slightly smaller size.

TEXTULARIA SCULPTURATA Cushman and ten Dam, n. sp. (Pl. 14, fig. 4)

Test about twice as long as broad, sides somewhat flattened and sculptured, periphery broadly rounded or even slightly angled, chambers numerous, distinct, somewhat inflated; sutures deeply depressed toward the inner end in the later portion, in the earlier portion not depressed; wall rather coarsely arenaceous but with a large proportion of cement so that the surface is nearly smooth, in the earlier portion with a distinct depression parallel to the periphery; aperture at the inner margin of the last-formed chamber with a distinct projecting lip at each side. Length 1.15-1.30 mm.; breadth 0.55-0.60 mm.; thickness 0.40-0.45 mm.

Holotype (ten Dam Coll. No. A 129) from the lower Pliocene at a depth of 371-376 meters, in Hilversum boring, western Netherlands. Paratypes: Geol. Stichting, Haarlem, Coll. No. F 1065 and Cushman Coll. No. 48695.

The species is fairly common in the lower Pliocene of the western Netherlands. The sculpturing of the test is rather unique.

LOXOSTOMUM LAMMERSI Cushman and ten Dam, n. sp. (Pl. 14, fig. 6)

Test elongate, slender, sides nearly parallel for much of the length, periphery broadly rounded; chambers numerous, distinct, somewhat inflated, increasing very gradually in size as added; sutures distinct, somewhat depressed; wall smooth, distinctly perforate; aperture terminal,

narrow, with a distinct lip. Length 1.15-1.30 mm.; breadth 0.22-0.28 mm.; thickness 0.17-0.19 mm.

Holotype (ten Dam Coll. No. A 122) from the lower Pliocene at a depth of 356-361 meters, in Breukelen boring, near Utrecht, Netherlands. Paratypes: Geol. Stichting, Haarlem, Coll. No. F 1066 and Cushman Coll. No. 48696.

The species is very common to abundant in some borings in the western Netherlands; otherwise rather rare.

The species is named for J. Lammers, skilled illustrator of foraminifera of the Netherlands Geological Survey.

The species somewhat resembles *L. mayori* (Cushman) but the surface is entirely smooth, the test more regular, and the sutures nearly straight.

ANOMALINA REINHOLDI Cushman and ten Dam, n. sp. (Pl. 14, fig. 7)
Anomalina semipunctata TEN DAM and REINHOLD (not BAILEY), Med. Geol. Stichting, ser. C-V, No. 1, 1941, p. 61, pl. 5, fig. 1.

Test with the ventral side convex, somewhat depressed in the umbilical region, dorsal side flattened or slightly concave, periphery broadly rounded; chambers about 6 in the adult whorl, strongly inflated on the ventral side, less so on the dorsal, increasing rather rapidly but uniformly in size as added; sutures on the ventral side strongly depressed, nearly radial, very slightly curved, on the dorsal side slightly depressed, slightly curved, somewhat obscured near the inner margin by irregular areas of shell material; wall smooth, finely perforate; aperture near the periphery but extending slightly onto the ventral side, with a distinct lip. Length 0.80 mm.; breadth 0.65 mm.; thickness 0.40 mm.

Holotype (ten Dam Coll. No. A 123) from the lower Pliocene at a depth of 381-385 meters in Breukelen boring, near Utrecht, Netherlands. Paratypes: Geol. Stichting, Haarlem, Coll. No. F 1067 and No. F 52 (aberrant specimen) and Cushman Coll. No. 48697.

The species is fairly common in the lower and middle Pliocene of the western Netherlands.

It is named for Dr. Th. Reinhold, Director of the Netherlands Geological Survey.

The specimen figured by ten Dam and Reinhold (1941) is only an abnormal form of this new species, although in their description they indicate the presence of normal specimens also. In the material examined by ten Dam and Reinhold this species was fairly rare but in later borings in the western Netherlands many specimens of this new species occurred.

CONTRIBUTIONS FROM THE CUSHMAN LABORATORY
 297. A FORAMINIFERAL FAUNA
 FROM AMCHITKA ISLAND, ALASKA*

BY JOSEPH A. CUSHMAN and RUTH TODD

The foraminiferal fauna here described was collected by R. R. Coats from the floor of a quarry at 125 feet elevation, 3 miles west of East Cape, Amchitka Island, Aleutian Islands, southwestern Alaska.

The fauna contains numerous species, some of which are new, and others with very interesting relationships. A large number of the species are also found in the Timms Point silt of California, referred on the basis of the foraminifera to the Pliocene, and some in the Pliocene of Japan. On the basis of the macrofossils, Woodring, Bramlette, and Kew refer the Timms Point silt to the lower Pleistocene (U. S. Geol. Survey Prof. Paper 207, 1946, pp. 43-46). A considerable number of the species are also found living off the coasts of California and Washington.

From all the indications the fauna would seem to be either Pleistocene or Pliocene in age, probably the latter. While the fauna is decidedly one of cold waters, it is not by any means arctic, and most of the species found today are in waters to the south of this area. Certain of the species, those of *Quinqueloculina* and *Cibicides*, are known from near-shore deposits and comparatively shallow water. The great abundance of two species of *Globigerina*, pelagic forms, would indicate that ocean currents from warmer areas, such as the present Japan Current, also influenced this area. It would seem probable, therefore, that the fauna was deposited in shallow water, near shore, and on an exposed coast.

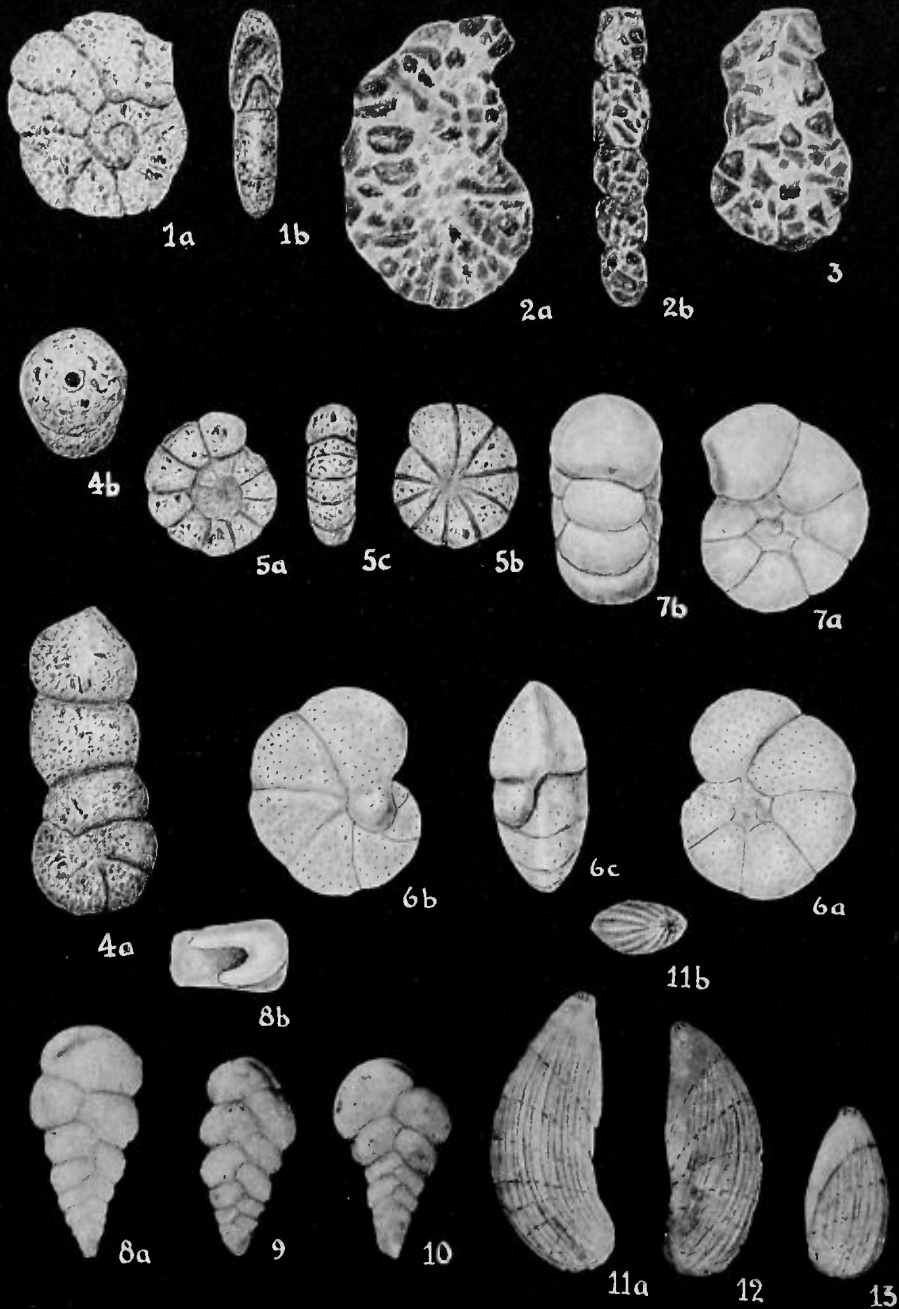
* Published by permission of the Director, U. S. Geological Survey.

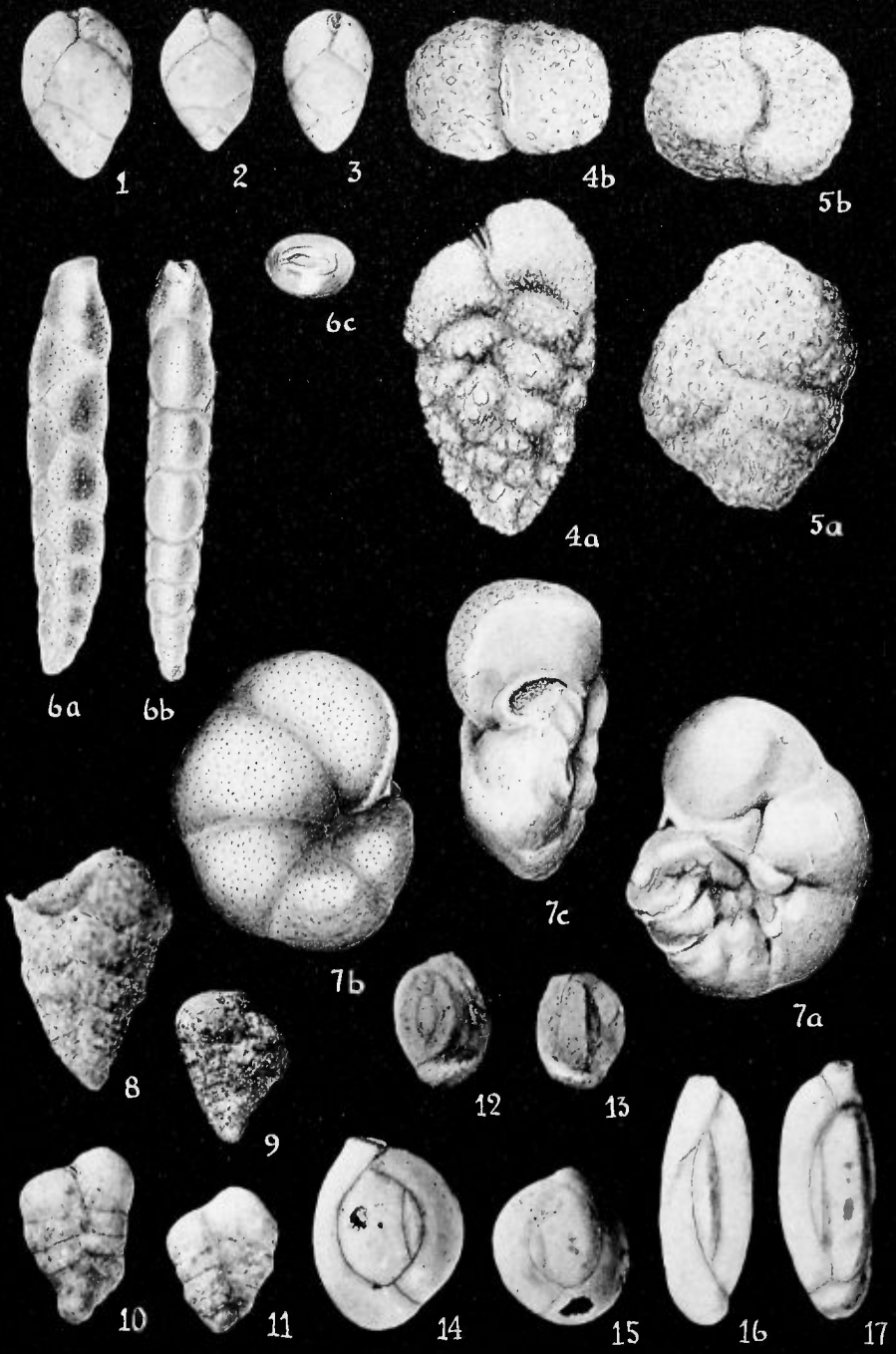
EXPLANATION OF PLATE 13

FIG. 1. *Ammobaculites advenus* Cushman and Applin, n. sp. $\times 40$. *a*, side view; *b*, apertural view. 2, 3. *A. agrestis* Cushman and Applin, n. sp. $\times 40$. 2, Holotype. *a*, side view; *b*, peripheral view. 3, Paratype. 4. *A. gratus* Cushman and Applin, n. sp. $\times 50$. *a*, side view; *b*, apertural view. 5. *Trochammina parallela* Cushman and Applin, n. sp. $\times 80$. *a*, dorsal view; *b*, ventral view; *c*, peripheral view. 6. *Valvulineria lobata* Cushman and Applin, n. sp. $\times 80$. *a*, side view; *b*, peripheral view. 7. *Anomalina obesa* Cushman and Applin, n. sp. $\times 80$. *a*, dorsal view; *b*, ventral view; *c*, peripheral view. 8-10. *Gaudryina deadericki* Cushman, n. sp. $\times 45$. 8, Holotype. *a*, front view; *b*, apertural view. 9, 10, Paratypes. 11-13. *Planularia deadericki* Cushman, n. sp. $\times 33$. 11, Holotype. *a*, side view; *b*, apertural view. 12, 13, Paratypes.

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The following species and varieties were found:

Family VALVULINIDAE

Genus KARRERIELLA Cushman, 1933

KARRERIELLA BACCATA (Schwager), var. ALASKENSIS Cushman and Todd, n. var.
(Pl. 14, figs. 10, 11)

Variety differing from the typical in the shorter, broader shape, more compressed test, and less symmetrical early portion.

Holotype of variety (Cushman Coll. No. 51901) from the Pliocene?, floor of a quarry at 125 feet elevation, 3 miles west of East Cape, Amchitka Island, Alaska.

Numerous specimens of this variety seem distinctly related to Schwager's species from the Pliocene of Kar Nicobar when compared with a series of topotypes.

KARRERIELLA sp. (Pl. 14, figs. 8, 9)

Rare specimens of a larger, less compressed form than the preceding variety occurred in this material but are too few to warrant a specific determination. It does not seem to be identical with any described species. The earliest stages seem to be composed of five chambers per whorl.

Family MILIOLIDAE

Genus QUINQUELOCULINA d'Orbigny, 1826

QUINQUELOCULINA AGGLUTINATA Cushman (Pl. 14, figs. 12, 13)

Quinqueloculina agglutinata CUSHMAN, Bull. 71, U. S. Nat. Mus., pt. 6, 1917, p. 43, pl. 9, fig. 2.—HANZAWA, Jap. Journ. Geol. Geogr., vol. 4, 1925 (1926), p. 37 (table).
—CUSHMAN and VALENTINE, Contr. Dept. Geol., Stanford Univ., vol. 1, No. 1, 1930, p. 9, pl. 1, fig. 7.—ASANO, Jap. Journ. Geol. Geogr., vol. 15, 1938, p. 90, pl. 9, fig. 11.

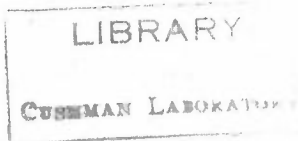
This species was originally described from material dredged "off Alaska." It occurs off the west coast of the United States and is recorded from the Pliocene of Japan. Specimens that seem very typical are common in this Alaska material.

QUINQUELOCULINA cf. VENUSTA Karrer (Pl. 14, figs. 16, 17)

A few specimens in this material are referred to Karrer's species which is widely recorded but the figures include a great variety of forms.

EXPLANATION OF PLATE 14

FIGS. 1-3. *Bulimina (Desinobulimina) diversa* Cushman and Stone, n. sp. × 23. 1, Holotype. 2, 3, Paratypes. 4. *Textularia sculpturata* Cushman and ten Dam, n. sp. × 40. a, front view; b, apertural view. 5. *T. decrescens* Cushman and ten Dam, n. sp. × 40. a, front view; b, apertural view. 6. *Loxostomum lammersi* Cushman and ten Dam, n. sp. × 53. a, front view; b, side view; c, apertural view. 7. *Anomalina reinholdi* Cushman and ten Dam, n. sp. × 53. a, dorsal view; b, ventral view; c, peripheral view. 8, 9. *Karrerella* sp. × 17. 10, 11. *K. baccata* (Schwager), var. *alaskensis* Cushman and Todd, n. var. × 23. 10, Holotype. 11, Paratype. 12, 13. *Quinqueloculina agglutinata* Cushman. × 17. 14, 15. *Q. vulgaris* d'Orbigny. × 33. 16, 17. *Q.* cf. *venusta* Karrer. × 45.



QUINQUELOCULINA VULGARIS d'Orbigny (Pl. 14, figs. 14, 15)

Specimens referable to this species are common in this material. The species occurs off the west coast of North America and is recorded from the Pliocene of California, and is widely recorded elsewhere.

QUINQUELOCULINA sp. (Pl. 15, figs. 1, 2)

A few specimens with a broad, slightly concave periphery in the adult chambers are difficult to place specifically. They somewhat resemble *Q. contorta* d'Orbigny from the Vienna Basin but are much smaller than topotypes, and other characters are not identical. More specimens would be necessary for a specific determination.

Genus **PYRGO** DeFrance, 1824**PYRGO** cf. **ELONGATA** (d'Orbigny) (Pl. 15, fig. 3)

A single specimen, here figured, is the only one of this genus found in the material examined. It is close to if not identical with *P. elongata*.

Family **OPHTHALMIDIIDAE**Genus **CORNUSPIRA** Schultze, 1854**CORNUSPIRA PLANORBIS** Schultze

Cornuspira planorbis SCHULTZE, Organismus Polythal., 1854, p. 40, pl. 2, fig. 21.—BRONN, Klassen und Ordnungen Thier-Reichs, vol. 1, 1859, p. 69, pl. 6, fig. 1.—CUSHMAN, Special Publ. 5, Cushman Lab. Foram. Res., 1933, pl. 16, fig. 1; Foraminifera, 3rd Ed., 1940, Key, pl. 16, fig. 1.—CUSHMAN and TODD, Special Publ. 21, Cushman Lab. Foram. Res., 1947, p. 7, pl. 1, fig. 24.

A single typical specimen of this widely occurring Recent species was found. It has been recorded also as "*Cornuspira involvens* (Reuss)" and has been found in the Pacific, Antarctic, and off the coasts of New England and Washington.

Family **LAGENIDAE**Genus **PLANULARIA** DeFrance, 1824**PLANULARIA CALIFORNICA** (Galloway and Wissler) (Pl. 15, figs. 4-7)

Cristellaria reniformis BAGG (not d'ORBIGNY), Bull. 513, U. S. Geol. Survey, 1912, p. 66, pl. 19, fig. 2.

Astaculus californicus GALLOWAY and WISSLER, Journ. Pal., vol. 1, 1927, p. 46, pl. 8, fig. 4.

Planularia californica CUSHMAN and GRAY, Special Publ. 19, Cushman Lab. Foram. Res., 1946, p. 12, pl. 2, fig. 16.

The types of this species are from the Pleistocene of Lomita Quarry, California, and it has been recorded from the Pliocene of Timms Point, California. The species is also found living off the west coast of North America. Typical specimens, as shown in fig. 7, have the ornamentation consisting of a few costae parallel to the dorsal margin. In addition, some larger specimens, as fig. 6, show additional costae in a quite dif-

ferent series, while the young specimens, figs. 4 and 5, have smooth, unornamented tests.

Genus **LAGENA** Walker and Jacob, 1798

LAGENA ACUTICOSTA Reuss (Pl. 15, fig. 8)

Numerous specimens similar to that figured occur in this material and seem to be included within the range of variation in this species.

LAGENA WILLIAMSONI (Alcock) (Pl. 15, fig. 9)

(For references, see CUSHMAN, Bull. 161, U. S. Nat. Mus., pt. 2, 1933, p. 34.)

Numerous specimens similar to that figured occur in the Alaska material. This is a common species in material from off the British Isles, and occurs in the Arctic off Spitzbergen, and off the west coast of the United States. It is recorded from the Pliocene of California and from the Pleistocene of the British Isles. From the literature it may be seen that numerous forms have been referred to this species and as most of the records are without figures no attempt has been made to give a complete synonymy. Our specimens are not wholly typical as the base has irregular excavations and those at the apertural end are somewhat more elongate than in the type figures. Also, our specimens show, when moistened, a fine transverse ridging similar to that in *Entosolenia catenulata* Williamson.

LAGENA sp. A (Pl. 15, fig. 10)

Numerous specimens similar to that figured occur in this material. They have very few costae and the apertural end has transverse ridges. It is difficult to assign it to any known species.

LAGENA sp. B (Pl. 15, fig. 11)

The figured specimen has more costae than the preceding and the apertural end is smooth. It also is difficult to place under any described species.

Family **POLYMORPHINIDAE**

Genus **GUTTULINA** d'Orbigny, 1839

GUTTULINA cf. **YAMAZAKII** Cushman and Ozawa (Pl. 15, fig. 12)

Rare specimens somewhat resemble this species found as a Recent species off the coast of Japan and fossil in the Japanese Pliocene.

GUTTULINA sp. (Pl. 15, fig. 13)

The single, large specimen here figured is the only one found in this material and as it is not well preserved it cannot be specifically identified, but is here figured for future reference.

Genus **PSEUDOPOLYMORPHINA** Cushman and Ozawa, 1928

PSEUDOPOLYMORPHINA CURTA Cushman and Ozawa (Pl. 15, fig. 14)

Pseudopolymorphina curta CUSHMAN and OZAWA, Proc. U. S. Nat. Mus., vol. 77, Art. 6,

1930, p. 105, pl. 27, fig. 3.—CUSHMAN, Special Publ. 12, Cushman Lab. Foram. Res., 1944, p. 23, pl. 3, fig. 16.

This species was described from the northern coast of New England and has been recorded from Hudson Bay and the Pliocene of Japan. Specimens from the Amchitka Island locality seem to belong here.

Genus SIGMOMORPHINA Cushman and Ozawa, 1928

SIGMOMORPHINA TRILOCULARIS (BAGG) (Pl. 15, fig. 15)

Polymorphina trilocularis BAGG, Bull. 513, U. S. Geol. Survey, 1912, p. 75, pl. 20, figs. 15-18.

Sigmomorpha trilocularis CUSHMAN and OZAWA, Jap. Journ. Geol. Geogr., vol. 6, 1929, p. 74, pl. 16, fig. 5.

Sigmomorpha trilocularis CUSHMAN and MOYER, Contr. Cushman Lab. Foram. Res., vol. 6, 1930, p. 54, pl. 7, fig. 16.—CUSHMAN and OZAWA, Proc. U. S. Nat. Mus., vol. 77, 1930, p. 136, pl. 36, fig. 5.—CUSHMAN and VALENTINE, Contr. Dept. Geol., Stanford Univ., vol. 1, No. 1, 1930, p. 20, pl. 5, fig. 8.—CUSHMAN and GRAY, Special Publ. 19, Cushman Lab. Foram. Res., 1946, p. 24, pl. 4, fig. 27.—CUSHMAN and TODD, Special Publ. 21, 1947, p. 11, pl. 2, fig. 7.

Specimens in the Alaska material evidently belong to this species recorded from off the coasts of California and Washington and found in the Pliocene of California and Japan.

Genus POLYMORPHINA d'Orbigny, 1826

POLYMORPHINA KINCAIDI Cushman and Todd (Pl. 15, figs. 16, 17)

Polymorphina kincaidi CUSHMAN and TODD, Special Publ. 21, Cushman Lab. Foram. Res., 1947, p. 12, pl. 2, figs. 9, 10.

This species was described from off the coast of Washington. Specimens apparently identical occur in the Alaska material and show in some specimens, similar to that in fig. 17, a greater development than in the Recent specimens.

Family NONIONIDAE

Genus ASTRONONION Cushman and Edwards, 1937

ASTRONONION VIRAGOENSE Cushman and Edwards

Astrononion viragoense CUSHMAN and EDWARDS, Contr. Cushman Lab. Foram. Res., vol. 13, 1937, p. 32, pl. 3, fig. 12.—CUSHMAN, U. S. Geol. Survey Prof. Paper 191, 1939, p. 36, pl. 10, fig. 6.—CUSHMAN and McCULLOCH, Allan Hancock Pacific Exped., vol. 6, No. 3, 1940, p. 168, pl. 18, fig. 12.—CUSHMAN and GRAY, Special Publ. 19, Cushman Lab. Foram. Res., 1946, p. 26, pl. 4, figs. 36-38.—CUSHMAN and TODD, Special Publ. 21, 1947, p. 13, pl. 2, fig. 16.

A single specimen may be referred to this species described from Virago Sound, British Columbia, and known from other localities in the eastern Pacific and from the Pliocene of Timms Point, California.

Genus ELPHIDIUM Montfort, 1808

ELPHIDIUM BARTLETTI Cushman

Elphidium bartletti CUSHMAN, Smithsonian Misc. Coll., vol. 89, No. 9, 1933, p. 4, pl. 1,

fig. 9; U. S. Geol. Survey Prof. Paper 191, 1939, p. 64, pl. 18, fig. 10; Contr. Cushman Lab. Foram. Res., vol. 17, 1941, p. 34, pl. 9, figs. 2, 3.

There are a number of specimens of this species in the Amchitka Island material. It is recorded from off Labrador and Greenland and in the late Tertiary, Pleistocene or Pliocene, of Nome, Alaska.

ELPHIDIUM ALASKENSE Cushman and Todd, n. sp. (Pl. 15, figs. 18, 19)

Test small, strongly compressed, periphery rounded; chambers fairly numerous, as many as 15 in the final whorl, of uniform shape, increasing very gradually in size as added, slightly if at all inflated; sutures distinct, strongly curved; wall in the central portion somewhat papillate, otherwise smooth, except for the numerous retral processes; aperture a low opening at the base of the peripheral face of the last-formed chamber. Length 0.60-0.75 mm.; breadth 0.30-0.36 mm.; thickness 0.15-0.18 mm.

Holotype (Cushman Coll. No. 51937) from the Pliocene?, floor of a quarry at 125 feet elevation, 3 miles west of East Cape, Amchitka Island, Alaska.

This species somewhat resembles *E. fax* Nicol but differs in the fewer chambers, rounded periphery, and flattened sides.

Genus ELPHIDIELLA Cushman, 1936

ELPHIDIELLA cf. **ARCTICA** (Parker and Jones) (Pl. 15, fig. 20)

A few specimens with the surface rather poorly preserved seem to have a double row of retral processes and may belong to this arctic species. Some of the specimens somewhat resemble *E. frigidum* Cushman, also an arctic species.

Family BULIMINIDAE

Genus BULIMINELLA Cushman, 1911

BULIMINELLA cf. **ELEGANTISSIMA** (d'Orbigny) (Pl. 15, fig. 21)

Very rare specimens may belong to this species.

Genus ENTOSOLENIA Ehrenberg, 1848

ENTOSOLENIA LUCIDA Williamson (Pl. 15, fig. 22)

(For earlier references, see CUSHMAN, Bull. 104, U. S. Nat. Mus., pt. 4, 1923, p. 33.)

Specimens from the Alaska material are very similar to those figured from the Pliocene of Timms Point, California (Special Publ. 19, Cushman Lab. Foram. Res., 1946, p. 30, pl. 5, figs. 16-18).

ENTOSOLENIA MARGINATA (Montagu), var. (Pl. 15, figs. 23, 24)

Numerous specimens are similar to those found in the Pliocene of Timms Point, California (Special Publ. 19, Cushman Lab. Foram. Res., 1946, p. 30, pl. 5, figs. 19-24). Some specimens, similar to that in fig. 23,

seem to have the same form but with the periphery broken away suggesting a double flange, but apparently due only to breakage.

ENTOSOLENIA cf. COMPRESSA (d'Orbigny) (Pl. 15, fig. 25)

The figured specimen resembles those found off the coast of Washington and referred to this species (Special Publ. 21, Cushman Lab. Forum. Res., 1947, p. 20, pl. 3, fig. 12).

ENTOSOLENIA ORBIGNYANA (Seguenza), var. (Pl. 15, fig. 26)

A single specimen here figured belongs in the group referred to this species but has the main body of the test with a peculiar ornamentation of slightly elongate depressions. No other specimens are available to show what may be the variations of this form.

ENTOSOLENIA CATENULATA Williamson (Pl. 15, fig. 28)

(For references, see CUSHMAN and TODD, Special Publ. 21, Cushman Lab. Forum. Res., 1947, p. 19.)

This widely distributed species has recently been recorded from off the coast of Washington in the above reference and from the Pliocene of Timms Point, California (Cushman and Gray, Special Publ. 19, 1946, p. 31, pl. 5, figs. 40-42).

ENTOSOLENIA SQUAMOSA (Montagu) (Pl. 15, fig. 27)

(For earlier references, see CUSHMAN, Bull. 104, U. S. Nat. Mus., pt. 4, 1923, p. 51.)

This species is also widely distributed and the Alaska specimens are very similar to those recorded from the Pliocene of Timms Point, California (Cushman and Gray, Special Publ. 19, Cushman Lab. Forum. Res., 1946, p. 31, pl. 5, figs. 37-39).

Genus VIRGULINA d'Orbigny, 1826

VIRGULINA NODOSA R. E. and K. C. Stewart (Pl. 16, fig. 1)

(For references, see CUSHMAN and GRAY, Special Publ. 19, Cushman Lab. Forum. Res., 1946, p. 31.)

Rare and rather poorly preserved specimens in the Alaska material may be referred to this species described from the Pliocene of California.

Genus BOLIVINA d'Orbigny, 1839

BOLIVINA PSEUDOPPLICATA Heron-Allen and Earland (Pl. 16, figs. 2, 3)

(For references, see CUSHMAN and GRAY, Special Publ. 19, Cushman Lab. Forum. Res., 1946, p. 34.)

This is a widely distributed species in the present oceans and has recently been recorded from the Pliocene of Timms Point, California.

Genus UVIGERINA d'Orbigny, 1826

UVIGERINA CUSHMANI Todd, Ms (Pl. 16, figs. 4, 5)

This species, which has been described from 147 fathoms, off Long Point, Catalina Island, California, in a paper in course of publication,

occurs abundantly in the Amchitka Island material. It is also known very widely in the eastern Pacific. It resembles *U. juncea* Cushman and Todd from the Pliocene of Timms Point, California, but differs in its larger, stouter test, and more strongly developed costae. The present specimens are not well enough preserved to show the hispid wall, and tend to be slightly larger than the types.

Genus **ANGULGERINA** Cushman, 1927

ANGULGERINA FLUENS Todd, Ms (Pl. 16, figs. 6, 7)

This species has been described, in a paper in course of publication, from Recent material from off Wrangell, Alaska. It occurs abundantly in typical form in the Amchitka Island material. It is characterized by its compressed aperture without a neck.

Family **ROTALIIDAE**

Genus **PATELLINA** Williamson, 1858

PATELLINA CORRUGATA Williamson (Pl. 16, fig. 9)

(For earlier references, see CUSHMAN, Bull. 104, U. S. Nat. Mus., pt. 8, 1931, p. 11.)

This is a widely distributed species, both fossil and Recent. It has recently been recorded from the Pliocene of Timms Point, California (Cushman and Gray, Special Publ. 19, Cushman Lab. Foram. Res., 1946, p. 37, pl. 6, figs. 22-24), and from off the coast of Washington (Cushman and Todd, Special Publ. 21, 1947, p. 20, pl. 3, fig. 13).

Genus **DISCORBIS** Lamarck, 1804

DISCORBIS VALVULATA (d'Orbigny) (Pl. 16, fig. 8)

(For earlier references, see CUSHMAN, Bull. 104, U. S. Nat. Mus., pt. 8, 1931, p. 33.)

Rare specimens from the Alaska material may be referred to this species.

Genus **EPONIDES** Montfort, 1808

EPONIDES FRIGIDUS (Cushman) (Pl. 16, figs. 10-13)

(For references, see CUSHMAN and TODD, Special Publ. 21, Cushman Lab. Foram. Res., 1947, p. 21.)

This is typically a cold water species. It was found to be common off the coast of Washington as noted in the above reference. The form referred to var. *calidus* Cushman and Cole from the Pliocene of Timms Point, California (Cushman and Gray, Special Publ. 19, 1946, p. 39, pl. 7, figs. 3-5), is closely related. Some of our Alaska specimens resemble the variety.

EPONIDES UMBONATUS (Reuss)

(For earlier references and figures, see CUSHMAN, Bull. 104, U. S. Nat. Mus., pt. 8, 1931, p. 52, pl. 11, figs. 1-3.)

This species was described from the Oligocene of Germany and has been recorded widely from Eocene to Recent, and probably many dif-

ferent forms have been included under this name. It is a distinctive form with a slightly sigmoid pattern to the ventral sutures, and the dorsal sutures radial instead of tangential. Rare specimens occur in the Amchitka Island material. Recent records for this species include the North Atlantic and the Antarctic regions.

EPONIDES COLUMBIENSIS (Cushman) (Pl. 16, figs. 14, 15)

Pulvinulina columbiensis CUSHMAN, Contr. Cushman Lab. Foram. Res., vol. 1, pt. 2, 1925, p. 43, pl. 7, fig. 1.

Eponides columbiensis CUSHMAN and TODD, Special Publ. 21, Cushman Lab. Foram. Res., 1947, p. 22, pl. 4, fig. 1.

This species is known only from off the coasts of British Columbia and Washington. Specimens in the Alaska material are fairly typical but much smaller.

Family CASSIDULINIDAE

Genus CASSIDULINA d'Orbigny, 1826

CASSIDULINA CALIFORNICA Cushman and Hughes (Pl. 16, figs. 16-18)

(For references, see CUSHMAN and GRAY, Special Publ. 19, Cushman Lab. Foram. Res., 1946, p. 39.)

This species was described from the Pliocene of Timms Point, California. It is also known from the Pleistocene of California and the Pliocene of Panama. It was recorded from off the coast of British Columbia and recently noted as abundant at certain localities off the coast of Washington (Cushman and Todd, Special Publ. 21, 1947, p. 22, pl. 4, fig. 2). The Alaska specimens are mostly typical but some specimens are slightly more compressed toward the periphery.

CASSIDULINA LIMBATA Cushman and Hughes (Pl. 16, fig. 22)

(For references, see CUSHMAN and GRAY, Special Publ. 19, Cushman Lab. Foram. Res., 1946, p. 42.)

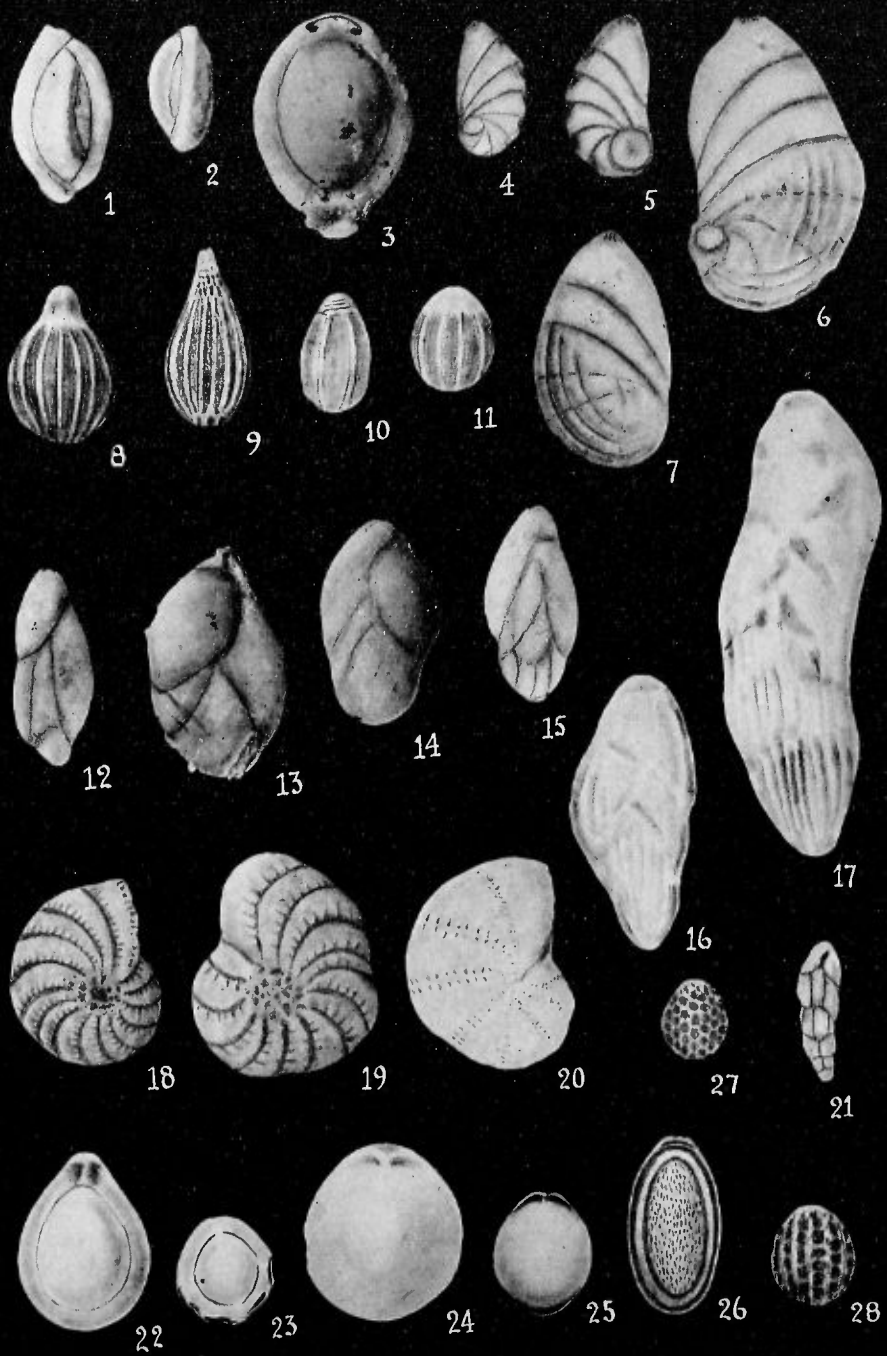
The types of this species are also from the Pliocene of Timms Point, California. It is recorded also from the Miocene and Pleistocene of

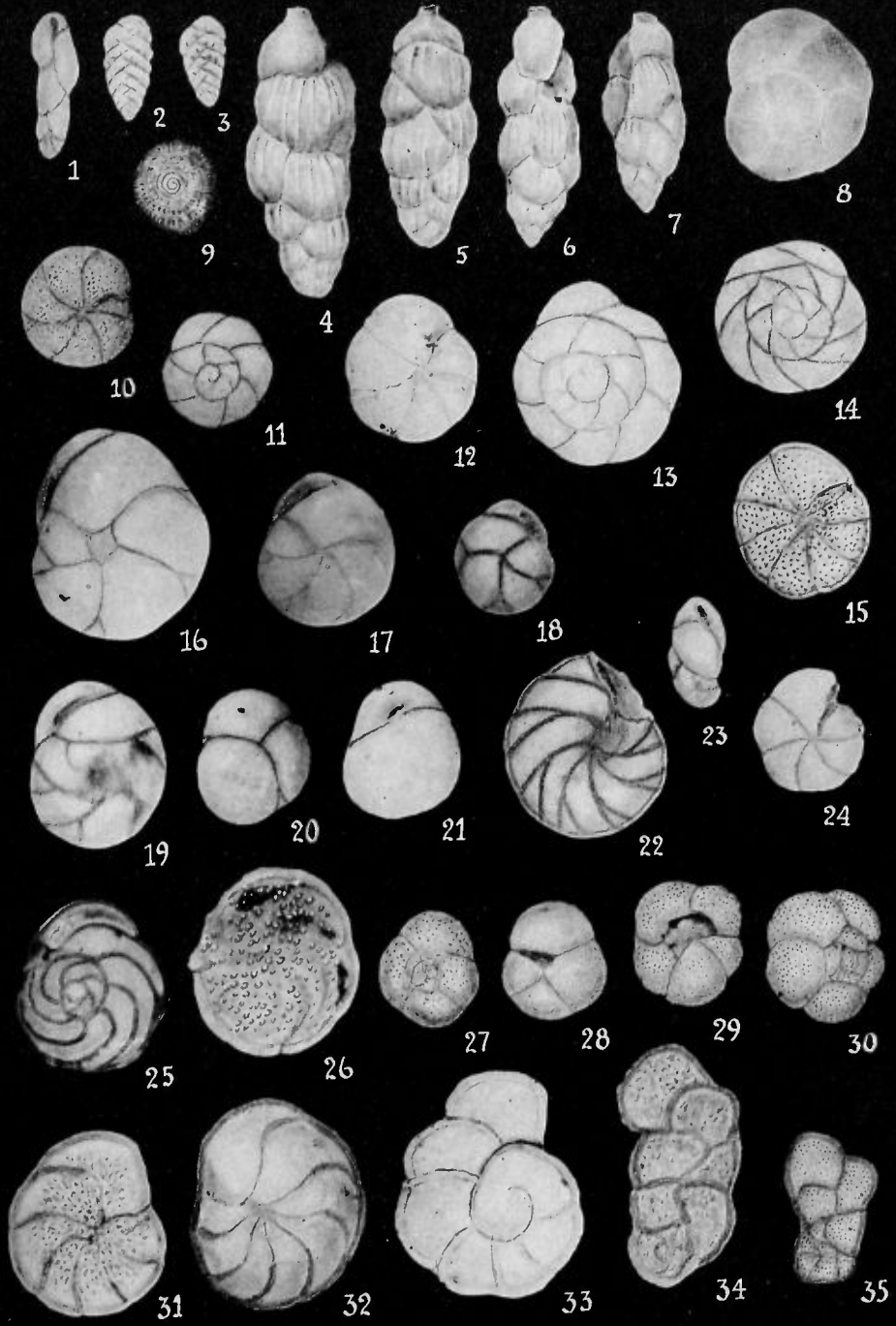
EXPLANATION OF PLATE 15

Figs. 1, 2. *Quinqueloculina* sp. × 33. 3. *Pyrgo* cf. *elongata* (d'Orbigny). × 17. 4-7. *Planularia californica* (Galloway and Wissler). × 33. 8. *Lagena acuticosta* Reuss. × 33. 9. *L. williamsoni* (Alcock). × 33. 10. *Lagena* sp. A. × 45. 11. *Lagena* sp. B. × 45. 12. *Guttulina* cf. *yamazakii* Cushman and Ozawa. × 17. 13. *Guttulina* sp. × 18. 14. *Pseudopolymorphina curta* Cushman and Ozawa. × 17. 15. *Sigmomorphina trilocularis* (Bagg). × 17. 16, 17. *Polymorphina kincaidi* Cushman and Todd. 16, × 33. 17, × 45. 18, 19. *Elphidium alaskense* Cushman and Todd, n. sp. × 45. 18, Paratype. 19, Holotype. 20. *Elphidiella* cf. *arctica* (Parker and Jones). × 45. 21. *Buliminella* cf. *elegantissima* (d'Orbigny). × 45. 22. *Entosolenia lucida* Williamson. × 45. 23, 24. *E. marginata* (Montagu), var. × 45. 25. *E.* cf. *compressa* (d'Orbigny). × 45. 26. *E. orbignyana* (Seguenza), var. × 45. 27. *E. squamosa* (Montagu). × 33. 28. *E. catenulata* Williamson. × 33.

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California, and living off the coast of California and Washington. Typical specimens occur in the Alaska material.

CASSIDULINA LOMITENSIS Galloway and Wissler (Pl. 16, fig. 19)

Cassidulina lomitensis GALLOWAY and WISSLER, Journ. Pal., vol. 1, 1927, p. 79, pl. 12, fig. 10.—CUSHMAN and GRAY, Special Publ. 19, Cushman Lab. Foram. Res., 1946, p. 43, pl. 7, fig. 18.

This species was described from the Pleistocene of Lomita Quarry, California, and is recorded from numerous localities in the Pliocene of California including Timms Point. The Alaska specimens are very rare.

CASSIDULINA QUADRATA Cushman and Hughes, var. (Pl. 16, figs. 20, 21)

A few very small specimens, two of which are figured, seem related to this species. More specimens are needed to give the full characters. They are most like the form that occurs in the Pliocene of Timms Point, California (Cushman and Gray, Special Publ. 19, Cushman Lab. Foram. Res., 1946, p. 42, pl. 7, figs. 11-13).

Genus **CASSIDULINOIDES** Cushman, 1927

CASSIDULINOIDES cf. **BRADYI** (Norman) (Pl. 16, fig. 23)

The figured specimen is the only one found in the Amchitka Island material and seems to be nearest to this species.

Family **CHILOSTOMELLIDAE**

Genus **PULLENIA** Parker and Jones, 1862

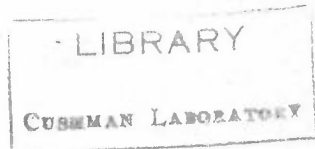
PULLENIA SALISBURYI R. E. and K. C. Stewart (Pl. 16, fig. 24)

(For earlier references, see CUSHMAN and GRAY, Special Publ. 19, Cushman Lab. Foram. Res., 1946, p. 43.)—CUSHMAN and TODD, Special Publ. 21, 1947, p. 22, pl. 4, fig. 5.

Numerous specimens in the Amchitka Island material are referred to

EXPLANATION OF PLATE 16

FIG. 1. *Virgulina nodosa* R. E. and K. C. Stewart. × 45. 2, 3. *Bolivina pseudoplicata* Heron-Allen and Earland. × 45. 4. 5. *Uvigerina cushmani* Todd, Ms. × 45. 6, 7. *Angulogerina fluens* Todd, Ms. × 45. 8. *Discorbis valvulata* (d'Orbigny). × 45. Dorsal view. 9. *Patellina corrugata* Williamson. × 45. 10-13. *Eponides frigidus* (Cushman). 10, 11, Young. × 45. 12, 13, Adult. × 33. 10, 12, Ventral views. 11, 13, Dorsal views. 14, 15. *E. columbiensis* (Cushman). × 33. 14, Dorsal view. 15, Ventral view. 16-18. *Cassidulina californica* Cushman and Hughes. 16, × 33. 17, 18, × 23. 19. *C. lomitensis* Galloway and Wissler. × 33. 20, 21. *C. quadrata* Cushman and Hughes, var. × 45. 20, Dorsal view. 21, Ventral view. 22. *C. limbata* Cushman and Hughes. × 33. 23. *Cassidulinoides* cf. *bradyi* (Norman). × 45. 24. *Pullenia salisburyi* R. E. and K. C. Stewart. × 45. 25, 26. *Planulina alaskensis* Cushman and Todd, n. sp. × 45. 25, Paratype, dorsal view. 26, Holotype, Ventral view. 27, 28. *Globigerina pachyderma* (Ehrenberg). × 45. 27, Dorsal view. 28, Ventral view. 29, 30. *G. quadrilatera* Galloway and Wissler. × 45. 29, Ventral view. 30, Dorsal view. 31, 32. *Cibicides alaskensis* Cushman and Todd, n. sp. × 33. 31, Paratype, dorsal view. 32, Holotype, ventral view. 33. *C. lobatulus* (Walker and Jacob). × 33. Dorsal view. 34, 35. *Dyocibicides biserialis* Cushman and Valentine. × 33. 34, Dorsal view. 35, Ventral view.



this species. Although they average nearly twice as large as the types from the Pliocene, upper Pico formation, of California, they are much closer in size and shape to the specimens from the Pliocene of Timms Point, Calif., and those from off the coast of Washington. Our specimens are also proportionately thicker and with a more rounded periphery in edge view than the types, and may prove to be distinct.

Family GLOBIGERINIDAE

Genus GLOBIGERINA d'Orbigny, 1826

GLOBIGERINA PACHYDERMA (Ehrenberg) (Pl. 16, figs. 27, 28)

Aristospira pachyderma EHRENBURG, Abhandl. k. Akad. Wiss. Berlin, 1872 (1873), p. 386, pl. 1, fig. 4.

Globigerina pachyderma H. B. BRADY, Rep. Voy. *Challenger*, Zoology, vol. 9, 1884, p. 600, pl. 114, figs. 19, 20.—PEARCEY, Trans. Glasgow Nat. Hist. Soc., vol. 2, 1890, p. 178.—EGGER, Abhandl. kön. bay. Akad. Wiss. München, Cl. II, vol. 18, 1893, p. 361, pl. 13, figs. 12-14, 79.—GOËS, Kongl. Svensk. Vet.-Akad. Handl., vol. 25, No. 9, 1894, p. 85.—HERON-ALLEN and EARLAND, Proc. Roy. Irish Acad., vol. 31, pt. 64, 1913, p. 105.—PEARCEY, Trans. Roy. Soc. Edinburgh, vol. 49, 1914, p. 1024.—HERON-ALLEN and EARLAND, Trans. Linn. Soc. London, ser. 2, vol. 11, 1916, p. 267; British Antarctic Exped., Zoology, vol. 6, 1922, p. 190.—CUSHMAN, Bull. 104, U. S. Nat. Mus., pt. 5, 1924, p. 14.—GALLOWAY and WISSLER, Journ. Pal., vol. 1, 1927, p. 43, pl. 7, fig. 13.—WIESNER, Deutsche Süd-Polar-Exped., vol. 20, Zool., 1931, p. 133.—HERON-ALLEN and EARLAND, *Discovery Reports*, vol. 4, 1932, p. 401, pl. 13, figs. 9-13.—EARLAND, l. c., vol. 7, 1933, p. 122; vol. 10, 1934, p. 178; vol. 13, 1936, p. 55.—CHAPMAN and PARR, Australasian Antarctic Exped., ser. C, vol. 1, pt. 2, 1937, p. 112.—STSCHEDRINA, Comptes Rendus (Doklady) Acad. Sci. URSS, vol. 19, No. 4, 1938, p. 321 (table).—PHLEGER, Bull. Geol. Soc. Amer., vol. 50, 1939, p. 1405, pl. 2, figs. 1, 2.—CUSHMAN and HENBEST, U. S. Geol. Survey Prof. Paper 196-A, 1940, p. 48, pl. 8, fig. 1.—CHAPMAN, Trans. Roy. Soc. So. Australia, vol. 65, 1941, p. 179.

Globigerina bulloides, "arctic variety," H. B. BRADY, Ann. Mag. Nat. Hist., ser. 5, vol. 1, 1878, p. 435, pl. 21, fig. 10.

Globigerina bulloides D'ORBIGNY, var. *borealis* H. B. BRADY, Proc. Roy. Soc. Edinburgh, vol. 11, 1882, p. 716.

This is a characteristic cold water species, described from Davis Strait, and recorded from both the Arctic and Antarctic and adjacent cold regions, as well as in the Pliocene of California, and the Pleistocene of cores from the continental slope, off the eastern United States. Abundant specimens occur in the Amchitka Island material. It is a distinctive form, very compact, with only very slightly incised sutures.

GLOBIGERINA QUADRILATERA Galloway and Wissler (Pl. 16, figs. 29, 30)

Globigerina quadrilatera GALLOWAY and WISSLER, Journ. Pal., vol. 1, 1927, p. 44, pl. 7, fig. 11.—KLEINPELL, Miocene Stratig. Calif., 1938, p. 345.—CUSHMAN and GRAY, Special Publ. 19, Cushman Lab. Foram. Res., 1946, p. 44, pl. 8, fig. 5.

Numerous specimens of this small *Globigerina* are referred here. Some are of the typical form with four chambers comprising the last whorl,

while others have five in the last whorl. The aperture is comparatively large and the last chamber is characteristically smaller than the previous one, as noted in the original description.

This species has been previously known only from the Pleistocene, Pliocene, and upper Miocene of California.

Family ANOMALINIDAE

Genus PLANULINA d'Orbigny, 1826

PLANULINA ALASKENSIS Cushman and Todd, n. sp. (Pl. 16, figs. 25, 26)

Test rather small, very strongly compressed, dorsal side very slightly convex, ventral side flattened or very slightly concave, periphery sub-acute or slightly rounded; chambers distinct on the dorsal side, largely obscured on the ventral side by the ornamentation, narrow and very strongly curved, not inflated, averaging 7 in the adult whorl; sutures rather indistinct, slightly limbate, not depressed, very strongly curved; wall on the dorsal side smooth, on the ventral side covered with fine papillae, with a tendency to an arrangement in radial lines; aperture small, near the periphery. Diameter 0.45-0.50 mm.; thickness 0.12-0.15 mm.

Holotype (Cushman Coll. No. 51990) from the Pliocene? floor of a quarry at 125 feet elevation, 3 miles west of East Cape, Amchitka Island, Alaska.

This species differs from *P. ariminensis* d'Orbigny in its slightly more convex and concave sides, slightly fewer chambers, and in the highly ornamented ventral side.

Genus CIBICIDES Montfort, 1808

CIBICIDES LOBATULUS (Walker and Jacob) (Pl. 16, fig. 33)

(For earlier references, see CUSHMAN, Bull. 104, U. S. Nat. Mus., pt. 8, 1931, p. 118.)

Large and well preserved specimens occur in abundance. Most of them are slightly distorted showing their attachment by the dorsal sides. The species is widely recorded stratigraphically throughout the Tertiary and is abundant in many localities in the present oceans, more widely known in the colder waters.

CIBICIDES REFULGENS Montfort ?

A single specimen, strongly planoconvex in shape, is referred with some question to this species which is widely recorded. It is similar to specimens found in the Pliocene of Timms Point, California (Cushman and Gray, Special Publ. 19, Cushman Lab. For. Res., 1946, p. 45, pl. 8, figs. 15-17), and off the coast of Washington (Cushman and Todd, Special Publ. 21, 1947, p. 23, pl. 4, fig. 7).

CIBICIDES ALASKENSIS Cushman and Todd, n. sp. (Pl. 16, figs. 31, 32)

Test of medium size, dorsal side flattened or slightly concave, ventral side strongly convex, periphery acute with a slight keel; chambers distinct, of uniform shape, increasing very gradually in size as added, 7 to 9 in the adult whorl; sutures distinct, very slightly if at all depressed, forming an S-curve on the ventral side, strongly curved on the dorsal side, slightly limbate; wall on the ventral side smooth, on the dorsal side with irregular raised papillae arranged in a more or less radial pattern, disappearing toward the periphery; aperture a low opening on the dorsal side at the base of the last-formed chamber. Diameter 0.70-0.90 mm.; thickness 0.25-0.30 mm.

Holotype (Cushman Coll. No. 51995) from the Pliocene?, floor of a quarry at 125 feet elevation, 3 miles west of East Cape, Amchitka Island, Alaska.

This species differs from *C. lobatulus* (Walker and Jacob) in the more S-shaped sutures and in the ornamentation of the dorsal side.

Genus DYOCIBICIDES Cushman and Valentine, 1930**DYOCIBICIDES BISERIALIS** Cushman and Valentine (Pl. 16, figs. 34, 35)

(For references, see CUSHMAN and GRAY, Special Publ. 19, Cushman Lab. Foram. Res., 1946, p. 46.)—CUSHMAN and TODD, Special Publ. 21, 1947, p. 23, pl. 4, fig. 8.

This widely distributed species occurs fairly commonly in the Alaska material. It is known from the Pacific and Atlantic and from the Pliocene of Florida and California and the Miocene of the Atlantic Coastal Plain, Florida, and Jamaica, and the Tertiary of Cuba and Australia.

298. A NEW NAME FOR *PROTEONINA TESTACEA* FROM THE LOWER CRETACEOUS OF THE NETHERLANDS

BY A. TEN DAM

Dr. Joseph A. Cushman and Dr. Hans E. Thalmann have called my attention to the fact that one of my specific names in my note: "Sur quelques espèces nouvelles ou peu connues dans le Crétacé Inférieur des Pays-Bas," is preoccupied.

Proteonina testacea ten Dam 1947 is preoccupied by *Reophax difflugiformis* H. B. Brady, var. *testacea* Flint, Ann. Rep. U. S. Nat. Mus., 1897 (1899), p. 273, pl. 16, fig. 1 and by *Proteonina testacea* (Flint) Cushman, Bull. 104, U. S. Nat. Mus., pt. 1, 1918, p. 49, pl. 20, figs. 1-4; Bull. 100, vol. 4, 1921, p. 50. I propose the new name in honour of Dr. Thomas Reinhold, Director of the Netherlands State Geological Survey:

PROTEONINA REINHOLDI nov. nom.

Proteonina testacea TEN DAM (not FLINT), Geologie en Mijnbouw, 8^e Jaargang, No. 2, 1947, p. 25, fig. 1.

Relizane, Algeria, July 25, 1947.

RECENT LITERATURE ON THE FORAMINIFERA

Below are given some of the more recent works on the foraminifera that have come to hand:

Marie, Pierre. Sur un Foraminifère nouveau du Crétacé supérieur marocain: *Lacosteina Gousskovi* nov. gen. et nov. sp.—Bull. Soc. Géol. France, ser. 5, vol. XIII, 1943, pp. 295-298, text figs. 1-6.—This new genus and species from the Upper Cretaceous has its early stages planispiral similar to genera of the Heterohelicidae but its later stages resemble the Buliminidae. A list of species occurring with it is given.

Sur *Flabellina Lacostei* et *Flabellina coranica* deux espèces nouvelles du Crétacé supérieur du Gharb (Maroc septentrional).—L. c., ser. 5, vol. XIV, 1944, pp. 395-407, text figs. 1-16.—Four species of *Flabellina* are described and figured, two new as noted.

Norvang, Aksel. The Zoology of Iceland, vol. II, pt. 2, Foraminifera, Copenhagen and Reykjavik, Oct. 1, 1945, pp. 1-79, text figs. 1-14.—There are 87 species found in the material from off Iceland and numerous others noted that were recorded by Terquem and Terquem in their work in 1886. The following are new: *Quinqueloculina nitida* n. sp.; *Q. quadrata* n. name (for *Q. sclerotica* Cushman 1929, not Karrer); *Nonionella turgida* (Williamson), var. *digitata* n. var.; *Cassidulina crassa* d'Orbigny, var. *reniforme* n. var.; *C. islandica* n. sp.; and forma *minuta* n. f.

Marine Lias in Jutland (A preliminary notice).—Medd. fra Dansk Geol. Forening, Kobenhavn, Bd. 11, Hefte 1, 1946, pp. 139-141.—A few specimens of foraminifera are recorded from well samples.

Almela, Antonio. Una Nueva Especie de "Dictyoconus" del Cenomanense Valenciano.—Notas y Comunicaciones Inst. Geol. Min. España, No. 16, 1946, pp. 1-7, pl.—A new species, *Dictyoconus valentinus*, described and figured.

Colom, G. Datos para el Conocimiento Estratigrafico y Tectonico del Pirineo Navarro. Nota Paleontologica sobre unos Microforaminiferos del Senonense de Navarra.—L. c., No. 16, 1946, pp. 147-153, pl. 1, 1 text fig.—Four species recorded and figured, one new subspecies, *Pseudoclavulina eggeri maxima*.

Crespin, I. Foraminifera and other micro-fossils from some of the Tertiary Deposits in the Vicinity of Aldinga Bay, South Australia.—Trans. Roy. Soc. So. Australia, vol. 70, pt. 2, Dec. 1, 1946, pp. 297-301.—A list of species is given and table of distribution in five localities.

Wood, A., and T. Barnard. Ophthalmidium: a study of nomenclature, variation, and evolution in the foraminifera.—Quart. Journ. Geol. Soc. London, vol. cii, pt. 2, July 31, 1946, pp. 77-113, pls. IV-X, text figs. 1-8.—Studies of species of this

genus and related genera are made, and developmental stages of various species described and figured. The following new species are described: *Ophthalmidium northamptonensis* n. sp.; *O. macfadyeni* n. sp.; and *Spiroloculina inopinata* n. sp.

Wood, A. The supposed Cambrian foraminifera from the Malverns.—L. c., vol. cii, pt. 4, April 30, 1947, pp. 447-460, pls. XXVI-XXVIII, text fig. 1.—Evidence is given showing that the material of supposed Cambrian age is really lower Liassic. A discussion of the evidence and its bearing on various classifications of the foraminifera is given.

The type specimen of the genus *Ophthalmidium*.—L. c., vol. cii, pt. 4, April 30, 1947, pp. 461-463, pls. XXIX-XXX.—The type specimen of *O. liasicum* Kubler and Zwingli, thought to be lost, has been found and has been refigured and redescribed as well as *O. carinatum* Kubler and Zwingli.

Le Calvez, Yolande. Révision des Foraminifères Lutétiens du Bassin de Paris, I. Miliolidae. Mémoires pour servir à l'explication de la carte géologique détaillée de la France, Paris, 1947, pp. 1-41, pls. I-IV.—The works of Terquem and d'Orbigny relating to this Eocene fauna have been reviewed. Terquem's figures were very inaccurate as a comparison with the type specimens shows. Altogether 71 species are noted, most of them figured, including 15 new species and 4 with new names.

ten Dam, A. Le développement des genres de foraminifères *Ceratobulimina* et *Lamarckina*.—Bull. Soc. Géol. France, ser. 5, vol. XVI, 1946, pp. 11-18, text figs. 1-8.—Notes numerous species, several figured, with two new: *Ceratobulimina gaultina* n. name (for *Pulvinulina hauerii* Chapman 1898, not d'Orbigny) and *Lamarckina hemiglobosa* n. sp.

Les espèces du genre de foraminifères *Quadratina*, genre nouveau de la famille des *Lagenidae*.—L. c., pp. 65-69, text figs. 1-6.—A new genus is erected, *Quadratina* (genotype *Q. depressula* n. sp.), and four other species placed in the genus: *Q. maertensi* (Reuss), *Q. quadrata* (Vieaux), *Q. strombecki* (Reuss), and *Q. subquadrata* (Tappan).

On Foraminifera of the Netherlands No. 9, Sur quelques espèces nouvelles ou peu connues dans le Crétacé Inférieur (Albien) des Pays-bas.—Geol. en Mijnbouw, 8 Jaarg., No. 2, Feb. 1947, pp. 25-29, pl., figs. 1-7.—Eight species are described, seven figured, the following new: *Proteonina testacea*, *Spiroplectamina rectangularis*, *Valoulineria gracillima*, and *Epistomina cretosa*.

On Foraminifera of the Netherlands No. 10, Sur une variété nouvelle d'*Elphidiella* arctica (Parker et Jones) dans le Pliocène des Pays-bas.—L. c., 9 Jaarg., No. 4, April 1947, p. 63.—A new name, var. *angulata*, for *Elphidiella hannai* ten Dam and Reinhold 1941 (not Cushman and Grant).

New names for two species of foraminifera from the lower Tertiary of the Netherlands.—Journ. Pal., vol. 21, No. 2, March, 1947, p. 186.—*Rotalia bartoniana* ten Dam for *R. granulosa* ten Dam (not Karrer, 1868), and *Glandulina peclensis* ten Dam for *G. nitida* ten Dam (not Neugeboren, 1850).

A new species of *Asterigerina* from the Upper Liassic of England.—L. c., vol. 21, No. 4, July, 1947, pp. 396, 397, text fig. 1.—*Asterigerina macfadyeni* described and figured.

- Cooper, Chalmer L. Upper Kinkaid (Mississippian) microfauna from Johnson County, Illinois.—L. c., vol. 21, No. 2, March, 1947, pp. 81-94, pls. 19-23, 1 text fig.—Several foraminifera are described and figured, the following new: *Millerella chesterensis*, *M. kinkaidensis*, *M. zelleri*, *Glomospira disca*, *Trepeilopsis mississippiana*, *Endothyra acuta*, *E. excentralis*, and *Palaeotextularia asper*.
- Thompson, M. L. Stratigraphy and fusulinids of Pre-Desmoinesian Pennsylvanian Rocks, Llano Uplift, Texas.—L. c., pp. 147-164, pls. 31-33, 1 text fig.—The following new species are described: *Nankinella plummeri*, *Staffella expansa*, *Eoschubertella texana*, and *Profusulinella marblensis*.
- ten Dam, A. and Th. Reinhold. New names for two species of foraminifera from the middle Miocene of the Netherlands.—L. c., p. 186.—*Cristellaria (Robulus) teschi* ten Dam and Reinhold for *C. (Robulus) grandis* ten Dam and Reinhold (not *C. americana grandis* Cushman, 1920), and *Vaginulina obtusicosta* ten Dam and Reinhold for *V. striatula* ten Dam and Reinhold (not Roemer, 1842).
- Höglund, Hans. Foraminifera in the Gullmar Fjord and the Skagerak.—Zoologiska Bidrag från Uppsala, Bd. 26, 1947, pp. 1-328, 32 pls., 312 text figs., 2 maps and 7 tables.—This work is a detailed and exhaustive study of 133 species and varieties included in the twelve arenaceous families and the Buliminidae, giving many figures of structure and much distributional data. There are 55 new species and varieties described and 4 new genera: *Labrospira* (genotype *Haplophragmium crassimargo* Norman), *Ammoscalaria* (genotype *Haplophragmium tenuimargo* Brady), *Morulaepecta* (genotype *M. bulbosa* n. sp.), and *Robertinoides* (genotype *Bulimina normani* Goës).
- Henson, Francis Roger Spencer. Preliminary Note on the Structure of the Foraminiferal Genus *Archaias* and Related Forms.—Abst. Proc. Geol. Soc. London, No. 1432, April 30, 1947, pp. 68, 69.—The various species referred to *Archaias* evidently need further study to determine their internal structure as noted by the author.
- Howe, Henry V. Status of Micropaleontology in Eastern Gulf Region.—Bull. Amer. Assoc. Petr. Geol., vol. 31, No. 4, April 1947, pp. 713-730.—Gives a bibliography with the new species listed in each paper and the papers are listed also in the text by formations.
- Hanzawa, Shoshiro. Eocene Foraminifera from Haha-jima (Hillsborough Island).—Journ. Pal., vol. 21, No. 3, May, 1947, pp. 254-259, pls. 39, 40.—A new species, *Nummulites boninensis*, is described and figured.
- Reinstatement of the genus *Heterosteginoides*, and the classification of the Miogypsinidae.—L. c., pp. 260-263, pl. 41.—Two subfamilies, Miogypsininae and Miogypsinoidinae, are also proposed for the family Miogypsinidae.
- Thalmann, Hans E. Bibliography of Foraminifera (Supplements for 1940 to 1945).—L. c., pp. 278-281.
- Index to new genera, species and varieties of Foraminifera for the year 1945, with supplements for the period 1939-1944, and addenda for 1942-1945.—L. c., vol. 21, No. 4, July, 1947, pp. 355-395.

- Cushman, Joseph A., and Frances L. Parker.** Bulimina and Related Foraminiferal Genera.—U. S. Geol. Survey Prof. Paper 210-D, 1947, pp. 55-176, pls. 15-30.—The species belonging to the genera of the first three subfamilies of the Buliminidae: Terebralininae, Turrilinae, and Bulimininae, except *Entosolenia*, are described and figured. Altogether 293 species and varieties are described and figured, 4 new and one new name. There are 97 other species noted that belong elsewhere and 21 later species are listed.
- di Napoli, Alliata, E.** Sull'Esistenza del Calabriano e del Siciliano, rivelata dai Microfossili, nel Sottosuolo della Pianura Lodigiana (Milano).—Riv. Ital. Pal., Anno LIII, Fasc. 1, 1947, pp. 1-6.—Lists several species of foraminifera, none new.
- Nauss, Arthur W.** Cretaceous microfossils of the Vermilion area, Alberta.—Journ. Pal., vol. 21, No. 4, July, 1947, pp. 329-343, pls. 48, 49, text figs. 1-3.—Numerous species are described and figured, 16 new species and 1 new variety of foraminifera and 1 new ostracod.

J. A. C.

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